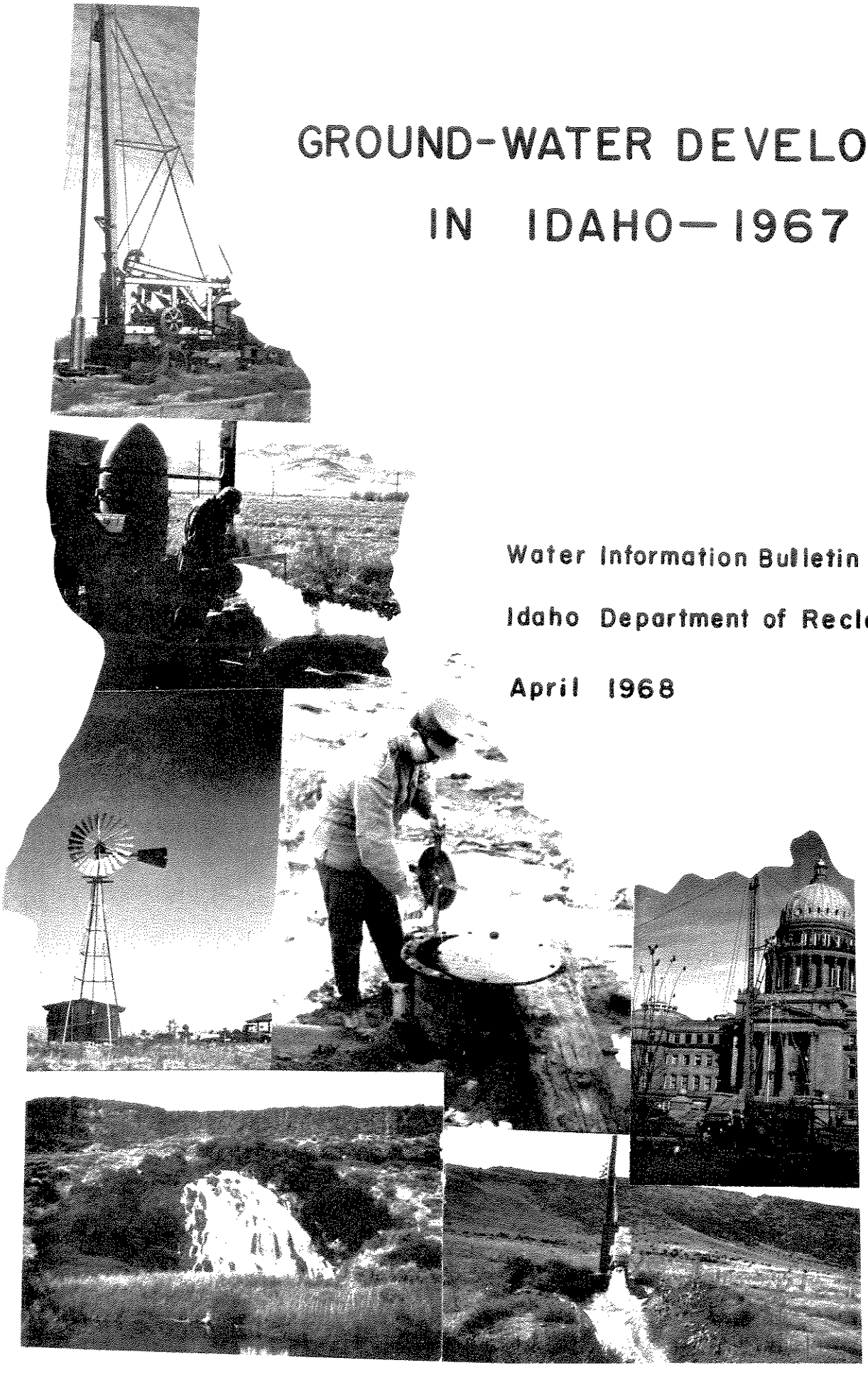
GROUND-WATER DEVELOPMENT IN IDAHO—1967



Water Information Bulletin No. 3

Idaho Department of Reclamation

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GROUND-WATER DEVELOPMENT IN IDAHO - 1967

by

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By Dale R. Ralston

PURPOSE AND OBJECTIVES

A major key to the future economic development of the State of Idaho lies in the continued orderly development of the ground-water resource. To date, the resource has allowed the extension of Agriculture into the more arid portions of the state, and has provided water for many growing industries. The administration of the ground-water resource of the state has been vested in the state reclamation engineer. This report is the first in an annual series compiled by the Department of Reclamation analyzing the development of this resource.

The objectives of this study can be divided into four headings:

A. Determine the rate of development of the ground-water resource of the state.

B. Determine where the ground-water development has occurred in 1967.

C. Estimate the total pumpage of ground water from each hydrologic area in 1967.

D. Estimate where the ground-water development will occur in future years.

ANALYSIS OF DATA

The development of the ground-water resource of Idaho in 1967 was analyzed by using two sources of data: the well drillers' reports submitted for wells drilled in 1967, and the applications filed for the appropriation of ground water during the year. The future potential development of the resource was projected by using the above mentioned data plus estimates of the present and potential ground-water pumpage. Other factors such as hydrologic capabilities and water right administration were not assessed in this report.

Work sheets were compiled listing the pertinent data from the well drillers' reports as they were received. The data were compiled by hydrologic areas or drainage basins (See Figure 1). The date the report was received, the date the well was drilled, the depth and diameter of the well, and the name of the person drilling the well were noted on the work sheets. The summation of these data are presented for each hydrologic area in Table 1. More than 2000 well drillers' reports were received by the department during the calendar year of 1967. Most of these reports were submitted as a result of the well driller licensing program initiated in 1967 which required that reports be submitted for all wells drilled after 1953. Four hundred and seventy eight of these reports were for wells drilled during 1967. An additional 84 reports were received during the first 70 days of 1968 for wells drilled in 1967, to bring the total to 562 reports. It is anticipated that some reports for wells drilled in 1967 will continue to be submitted throughout 1968.

Figure 1

Hydrologic Areas or Drainage Basins in Idaho

Numbers	Basin Name
11 - 17	Great Basin
21 - 29	Snake River Tributaries above American Falls
31 - 37	Snake Plain & Tributaries
41 - 47	Snake River Tributaries - South Side
51 - 57	Owyhee County
61 - 69	Southwest Idaho
71 - 79	Salmon River
81 - 87	Clearwater River
91 - 98	Columbia River Tributaries

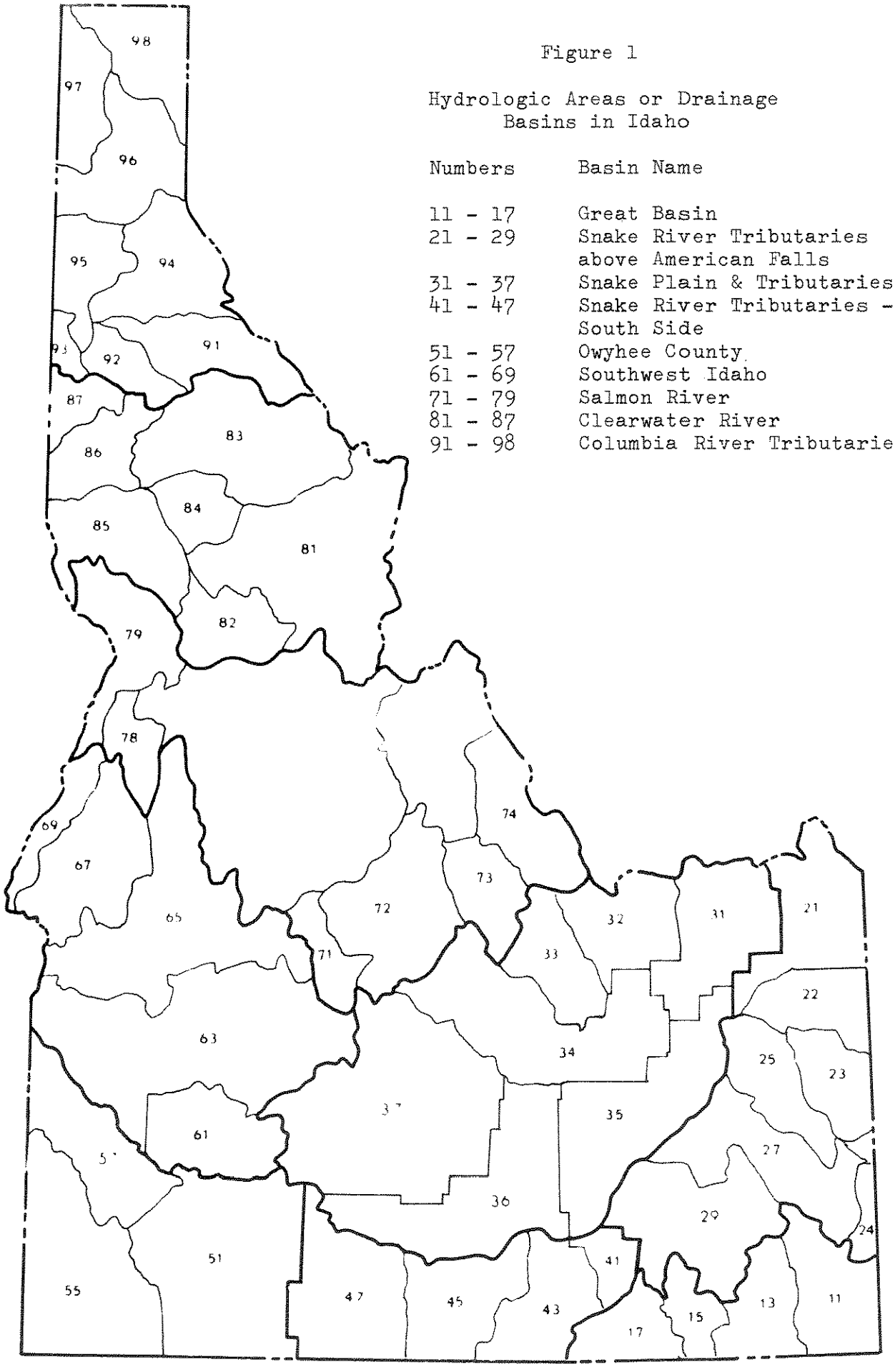


Table 1
HYDROLOGIC DATA - 1967

Area Number	Hydrologic Area	Number of Wells Reported Drilled in 1967	Average Diameter (inches)	Average Depth (feet)	Number of Applications Submitted for Ground Water 1967	Total Quantity Filed On (cfs)	Average Quantity Filed On (cfs)	Estimated Present Ground Water Discharge (1000) Acre-feet per year	Estimated Potential Ground Water Discharge (1000) Acre-feet per year	Estimated Percentage of Well Drillers' Reports on File
- 17	Great Basin	15	10.0	132.3	13	60.6	4.7	80	829	2
11	Bear River above Alexander	9	8.2	99.1	1	2.0	2.0			
13	Bear River - Alexander to State Line	1	12.0	200	2	3.0	1.5	62	375	
15	Malad River	3	10.0	198.3	2	8.0	4.0			
17	Great Salt Lake	2	17.0	137.5	8	47.6	6.0	18	454	
- 29	Snake River Tributaries above American Falls	73	8.6	147.1	22	113.9	5.2	200	698	12
21	Henrys Fork	8	9.0	152.1	0	0.0	0.0	11	11	
22	Teton River	8	9.0	252.4	5	18.8	3.8	100	287	
23	Snake River Tributaries above Heise	1	6.0	100	1	6.4	6.4	3	25	
24	Salt River	0	0.0	0.0	0	0.0	0.0	--	--	
25	Willow Creek	9	7.3	185.9	0	0.0	0.0	16	16	
27	Blackfoot River	23	7.0	94.5	4	54.6	13.7	30	190	
29	Portneuf River	24	10.6	148.2	12	34.1	2.8	40	169	
- 37	Snake Plain and Tributaries	82	10.8	225.1	95	524.4	5.5	2419	5478	28
31	Camas Creek and Mud Lake	8	14.2	277.6	14	89.5	6.4	212	370	
32	Medicine Lodge and Birch Creeks	0	0.0	0.0	3	19.0	6.3	7	67	
33	Little Lost River	6	17.3	318.7	2	10.4	5.2	65	421	
34	Big Lost River and N.R.T.S.	1	6.0	65	7	52.6	6.6	40	594	
35	Aberdeen-Springfield	32	11.4	210.3	31	191.5	6.2	1154	1809	
36	Minidoka-Jerome	20	9.4	267.9	30	119.4	4.0	882	1951	
37	Wood Rivers	15	7.2	145.1	8	41.9	5.1	59	266	
- 47	Snake River Tributaries - South Side	35	10.6	368.3	39	243.8	6.2	912	1236	16
41	Rock Creek	0	0.0	0.0	0	0.0	0.0	12	42	
43	Raft River	6	19.0	583.5	0	0.0	0.0	308	590	
45	Goose Creek - Rock Creek	16	9.0	320.2	21	160.9	7.7	577	577	
47	Salmon Falls Creek	13	8.8	328.2	18	82.9	4.6	15	27	

51 - 57	Owyhee County	14	8.4	351.3	25	143.1	5.7	143	557	3
51	Bruneau River	3	8.0	554.0	18	97.5	5.4	82	376	
55	Owyhee River	3	6.7	187.7	0	0.0	0.0	--	20	
57	Snake River Tributaries - Grandview to Homedale	8	9.2	336.6	7	45.6	6.5	61	161	
61 - 69	Southwest Idaho	228	7.7	163.0	88	305.8	3.5	218	739	32
61	Mountain Home	13	11.4	343.2	15	83.2	5.5	15	309	
63	Boise River	166	7.7	167.2	58	198.6	3.4	180	404	
65	Payette River	42	6.5	87.3	10	13.7	1.4	6	9	
67	Weiser River	7	7.7	181.6	5	10.3	2.1	17	17	
69	Snake River Tributaries - Weiser to Grande Ronde River	0	0.0	0.0	0	0.0	0.0	--	--	
71 - 79	Salmon River	26	6.9	49.5	4	3.8	1.0	3	80	2
71	Stanley Basin	1	6.0	85	0	0.0	0.0			
72	Salmon River - Stanley to Ellis	2	6.0	96.5	2	0.3	0.2			
73	Pahsimeroi River	0	0.0	0.0	1	3.0	3.0			
74	Lemhi River	9	7.6	54.3	0	0.0	0.0			
75	Salmon River - Ellis to Middle Fork	14	6.7	37.1	0	0.0	0.0			
77	Salmon River - Middle Fork and South Fork to Riggins	0	0.0	0.0	0	0.0	0.0			
78	Little Salmon River	0	0.0	0.0	1	0.5	0.5			
79	Salmon River - Riggins to and Snake River Tributaries - Grande Ronde to Salmon River	0	0.0	0.0	0	0.0	0.0			
81 - 87	Clearwater River	24	8.0	209.6	2	0.11	0.05	1	7	2
81	Middle Fork	1	6.0	118	0	0.0	0.0			
82	South Fork	1	6.0	114	0	0:0	0.0			
83	North Fork	0	0.0	0.0	0	0.0	0.0			
84	Main Stem and Tributaries - Kooskie to Ahsahka	7	8.9	155.6	0	0.0	0.0			
85	Camas Prairie - Lewiston	6	8.3	283.8	1	0.1	0.1			
86	Potlatch River	3	7.3	193.0	1	0.01	0.01			
87	Palouse River	6	7.7	238.0	0	0.0	0.0			
91 - 98	Columbia River Tributaries	65	6.7	118.3	17	39.5	2.3	40	207	3
91	St Joe River	0	0.0	0.0	0	0.0	0.0	--	--	
92	St Maries River	3	6.0	151.0	0	0.0	0.0	--	--	
93	Spokane River Tributaries	1	6.0	168	0	0.0	0.0	--	--	
94	Coeur d'Alene River	6	7.7	121.5	0	0.0	0.0	--	--	
95	Lake Coeur d'Alene - Rathdrum Prairie	22	7.4	139.4	13	30.4	2.3	40	184	
96	Pend Oreille	16	6.2	102.6	3	6.1	2.0	--	23	
97	Priest River	16	6.0	94.1	0	0.0	0.0	--	--	
98	Kootenai River	1	6.0	128	1	3.0	3.0	--	--	
	Total State	562	8.4	178.2	305	1435.0	4.7	3163	8861	100

The average diameter of the wells reported drilled in 1967 was 8.4 inches with an average depth of 178 feet.

The number of applications submitted to appropriate ground water in 1967 represent a barometer of the present and future development of the resource. The application data were compiled to indicate (1) the number of filings in each hydrologic area with a total for the state, (2) the total quantity filed upon for each area and the state, and (3) the average quantity filed upon for each area and for the state. These data are presented in Table 1. Three hundred and five applications were filed for the diversion of ground water in 1967, totaling 1435 cubic feet per second (cfs) for the state, with an average diversion of 4.7 cfs per filing.

Estimates of present and potential ground-water pumpage are also important tools in assessing the development of the ground-water resource. Pumpage was estimated from the preliminary data prepared by the U. S. Soil Conservation Service for the Columbia-North Pacific report. These data include an estimate of the number of acres presently irrigated and potentially irrigable using ground water. The data were estimated by local Soil Conservation Service personnel for all of the small watersheds in the state. The estimates of acres presently irrigated by ground water include those areas where ground water was used as a supplementary source as well as a primary source. The estimates of acres potentially irrigable by ground water were derived by choosing the logical or most feasible source of irrigation water for lands classified by soil type as

irrigable. The areas of potential ground-water development were limited by an arbitrarily chosen maximum pumping lift of 700 feet. This designation was used primarily for the Snake River Plain in denoting areas of potential ground-water development. Areas presently irrigated from surface sources were not included in the estimates of acres potentially irrigable from ground water. The designation of four areas of the state as critical ground-water areas were considered in the estimate of acres potentially irrigable from ground water. Water right considerations and hydrologic factors such as yield, drawdown, and recharge were not included in the estimates of lands potentially irrigable using ground water. These factors could in many cases limit the development of the resource to a level less than the potential.

The ground-water pumpage data were obtained by multiplying pumpage values in acre-feet per acre by the number of acres irrigated by ground water. The pumpage values were estimated for each hydrologic area from the U. S. Soil Conservation Service Publication, "Irrigation Guide for Southern and Southwestern Idaho - 1967". The present ground-water pumpage for the state was estimated as 3.7 million acre-feet per year, and the potential pumpage as 8.6 million acre-feet per year. (See Table 1). These data, while preliminary, represent the best information available at the present time.

The final data compiled were the estimates of the total number of well driller reports presently on file with the Department of Reclamation for each major basin and for the entire state. The data

are presented as percentages of the total number of reports on file, estimated as 8,500 (See Table 1).

Great Basin

The Great Basin drainages (11 - 17) underwent a moderate development of ground water in 1967. Three percent of the drillers' reports and four percent of the ground-water applications in the state were filed for this area in 1967. Most of the drillers' reports were from area 11, the Bear River drainage above Alexander. The shallow average depth of wells indicate that a large percentage of these wells might have been drilled for domestic purposes. The majority of the new filings were for area 17, the direct drainage to the Great Salt Lake. The large average quantity appropriated (6.0 cfs) would indicate that the majority of these filings were for irrigation. The estimated present and potential discharge data indicate that the Great Basin area in Idaho has only developed about 10 percent of its ground-water potential. The data imply that much of the ground-water potential is in area 17, the direct drainage to the Great Salt Lake. The development of the water resource of this area may be limited by the hydrologic capabilities of the aquifer system and by possible interstate water rights considerations.

Snake River Tributaries Above American Falls

The drainages included in the Snake River tributaries above American Falls (21 - 29) encompass a large portion of the northeastern part of the state. Most of this area underwent a moderate development of ground water in 1967 with the exception of the fairly extensive development in the Blackfoot and Portneuf River basins (27 and 29). The Snake River tributaries area included about 13 percent of the drilled wells reported, and about 7 percent of the appropriations filed for ground water. A large percentage of the wells reported drilled were in the Blackfoot and Portneuf drainages. The general shallow depth of the wells in the Blackfoot drainage along with the low number of applications filed indicate that much of the development in this area is for domestic purposes. The wells reported in the Portneuf drainage have a larger average diameter and a greater depth. This area also had the majority of the new filings in the area of the Snake River tributaries above American Falls, and will probably be the center of future ground-water development. The estimated present and potential ground-water pumpage data indicate that the area of the Snake River tributaries above American Falls has developed only about 29 percent of its ground-water potential. Most of the future development will probably occur in the Blackfoot and Portneuf drainages with some development in the Teton Basin.

Snake River Plain and Tributaries

The area of the Snake River Plain and tributaries includes the major portion of south central Idaho, and some of the largest ground-water developments in the state. This area accounted for 15 percent of the drillers' logs submitted and 31 percent of the applications filed in 1967. The southern portion of the area (35 Aberdeen-Springfield, 36 Minidoka-Jerome, and 37 Wood Rivers) accounted for 82 percent of the wells reported drilled and 73 percent of the applications filed in the area in 1967, and had one of the largest growths in ground-water development in the state. In the northern portion of the area (31 Camas Creek and Mud Lake, 32 Medicine Lodge and Birch Creeks, 33 Little Lost River, and 34 Big Lost River and N. R. T. S.) only the Mud Lake area underwent appreciable ground-water development during 1967. Much of the growth in the Minidoka-Jerome area is the result of the ground-water portion of the U. S. Bureau of Reclamation Minidoka Project. A portion of the growth is the result of the agricultural development along the edge of the Snake River Plain. The area included in the Snake River Plain and tributaries represents the greatest potential for future ground-water development in the state. At present, the area includes approximately 65 percent of the ground-water pumpage in the state and is only developed to approximately one-half of its potential. The centers for future development will probably continue to be the Aberdeen-Springfield and Minidoka-Jerome areas. The Big and Little Lost Rivers and Mud Lake areas will also continue to sustain ground-water development.

Snake River Tributaries - South Side

The tributaries on the south side of the Snake River include four major drainages (41 - 47), three of which support substantial ground-water development. All of the four critical ground-water areas are located in these drainages. The Raft River basin (43), completely closed to ground-water development with the exception of the extreme northern portion, had only six wells reported drilled in 1967. These wells were either replacements drilled on existing permits, or domestic wells. The modification of the Goose Creek-Rock Creek critical ground-water area into the Oakley-Kenyon, Artesian City, and Cottonwood critical areas sparked some intensive development in the areas removed from the critical designation. Most of the 21 applications submitted for the appropriation of ground water were filed as a result of the opening. A total of 16 wells were reported drilled in the Rock Creek-Goose Creek area in 1967, more than half of which were drilled after the modification of the critical area boundaries. The Salmon Falls Creek area (47) underwent a moderate ground-water development with 13 wells reported drilled and 18 applications filed to divert ground water. The fourth drainage south of the Snake River, Rock Creek (41), indicated no ground water development.

The potential ground-water development of the area drained by the Snake River tributaries on the south side is very limited. The

critical ground-water designations preclude development of a large portion of the drainages. The area opened by redesignation of the critical areas and small portions of the Rock Creek and Salmon Falls Creek areas provide the greatest potential for future ground-water pumpage.

Owyhee County

Owyhee County (51 - 57) includes the large, sparsely developed area in the extreme southwestern portion of the state. The area experienced only a small development of ground water in 1967, with 2 percent of the wells reported drilled in the state and 8 percent of the applications filed for ground water. The Bruneau River basin (51) is the most active portion of the area, with a fairly extensive ground-water development in Little Valley. The area along the south side of the Snake River (57), which experienced a period of intensive well development during the period 1900-1920, is presently not undergoing an appreciable development of the ground-water resource. Most of the new well development is to provide water for irrigation above the surface distribution system. The Owyhee River basin (55) does not presently have an appreciable ground-water development, and is not expected to undergo much growth in the future. The future ground-water development in the Owyhee County area is expected to center in the Bruneau River basin where only 22 percent of the ground-water potential has been developed. Some development is ex-

pected along the Snake River from Grand View to Homedale.

Southwest Idaho

The southwest Idaho area (61 - 69) includes both the center of population and the center of ground-water development in the state. Approximately 40 percent of the wells reported drilled in 1967 and 29 percent of the applications filed for ground water were for this area. The center of this development has been the Boise River area (63), where 30 percent of the wells reported drilled in the state and 19 percent of the ground-water applications were filed. Many of the wells drilled in this area were small domestic holes in the Boise, Nampa, and Caldwell areas. The primary locations of the larger irrigation wells have been in southern Ada County and Canyon County. A fairly extensive ground-water development has also occurred in the Payette River basin (65). Many of the 42 wells reported drilled in this area are believed to be small domestic wells, because of the small average diameter and depth, and the large ratio of wells drilled to applications filed. The other major area of interest in southwestern Idaho is the Mountain Home area (61). This area has been subjected to an extensive growth of ground-water pumpage south of the City of Mountain Home. The Weiser River basin (67) and the Snake River tributaries from Weiser to the Grande Ronde River (69) areas have had a very limited growth of ground-water pumpage in 1967. The potential ground-water development for irrigation in

southwestern Idaho is limited to the Boise River (63) and Mountain Home (61) areas with the larger development in southern Ada County and western Elmore County. A large number of wells will continue to be drilled in the Boise River and Payette River basins (63 and 65) as more land is developed for urban use and domestic water supplies are needed.

Salmon River

The Salmon River basin (71 - 79) in central Idaho comprises one of the largest hydrologic areas in the state. Much of this region is mountainous, however, and the ground-water development is very limited. Only 5 percent of the wells reported drilled in 1967 and 1 percent of the applications filed for ground water in the state were for this area. Most of the wells drilled in the area are believed to be for domestic purposes with a small average diameter and depth. The potential ground-water development in the Salmon River basin is very limited. It is expected that the present rate of development will continue as more small wells are drilled for domestic needs.

Clearwater River

The Clearwater River basin (81 - 87) includes a large portion of northern Idaho. The area is similar to the Salmon River in that

the ground-water development has been very limited. About 4 percent of the wells reported drilled in 1967 and 1 percent of the applications filed for ground water were in the Clearwater basin. Approximately one-half of the wells reported drilled in the basin are in the Camas Prairie-Lewiston area (85). Most of these wells are believed to be for domestic purposes. The potential ground-water development in this area is very limited, with most of the wells expected to be drilled as the need arises for domestic purposes.

Columbia River Tributaries

The extreme northern portion of the state, included as Columbia River tributaries (91 - 98), underwent a moderate development of the ground-water resources in 1967. Approximately 12 percent of the wells reported drilled and 6 percent of the applications filed in the state were for this area. A large percentage of the wells reported drilled in northern Idaho are located in the Lake Coeur d'Alene-Rathdrum Prairie (95) area. This area also accounted for most of the applications filed for ground water in 1967. A number of wells were also drilled in the Pend Oreille (96) and Priest River (97) areas. Many of these wells are believed to be for domestic purposes because of the small average diameter and depth and the low number of applications filed. The remainder of northern Idaho had a limited development of the ground-water re-

source. The Lake Coeur d'Alene-Rathdrum Prairie area is the primary area of ground-water potential in northern Idaho. This area has been developed to only about 22 percent of the total ground-water potential. The remainder of northern Idaho will probably continue development at a rate governed by the need for small domestic supplies.

DISCUSSION OF RESULTS

The areal distribution of the number of wells reported drilled in 1967 (Figure 2) indicates that the ground-water development was centered in southern Idaho. The distribution is partially the result of the large number of domestic wells drilled in various portions of the state. Most of the well development in the northern and extreme eastern portions of the state is believed to be for domestic purposes. The areal distribution of applications filed for ground water in 1967 (Figure 3) indicate the centers of development. The filings are grouped primarily in the agricultural areas of south-central Idaho.

The relationship of the number of domestic wells to irrigation wells is illustrated by a graph of the diameter of wells reported drilled in 1967 (Figure 4). The vast majority of the wells drilled are 6 inches in diameter. Except for areas of flowing artesian wells, 6-inch diameter wells are used primarily for domestic purposes. The second most frequently used casing diameter, 8-inch, is used

Figure 2

Number of Well Drillers' Reports
Submitted for Wells Drilled
in 1967

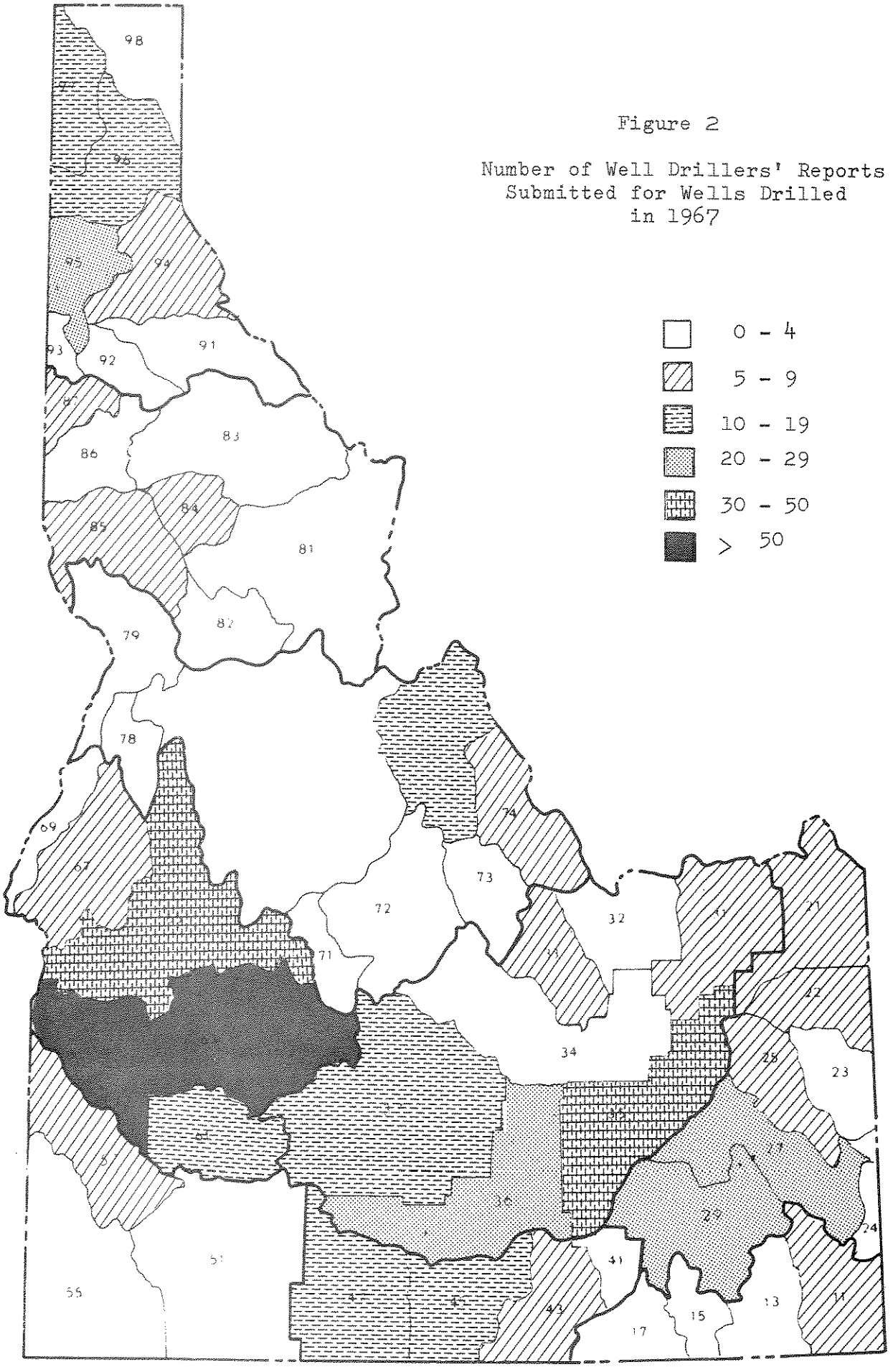
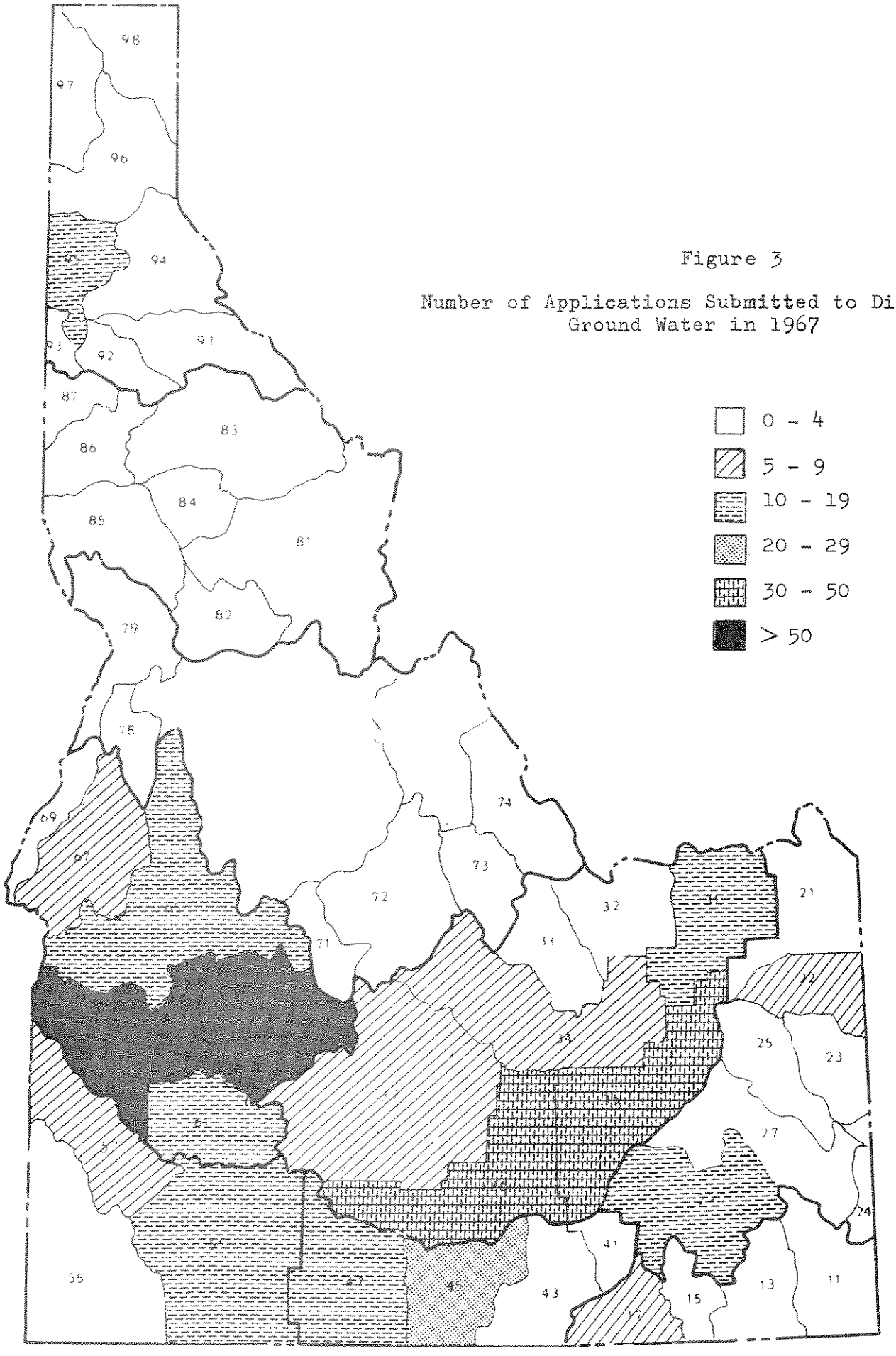


Figure 3

Number of Applications Submitted to Divert Ground Water in 1967



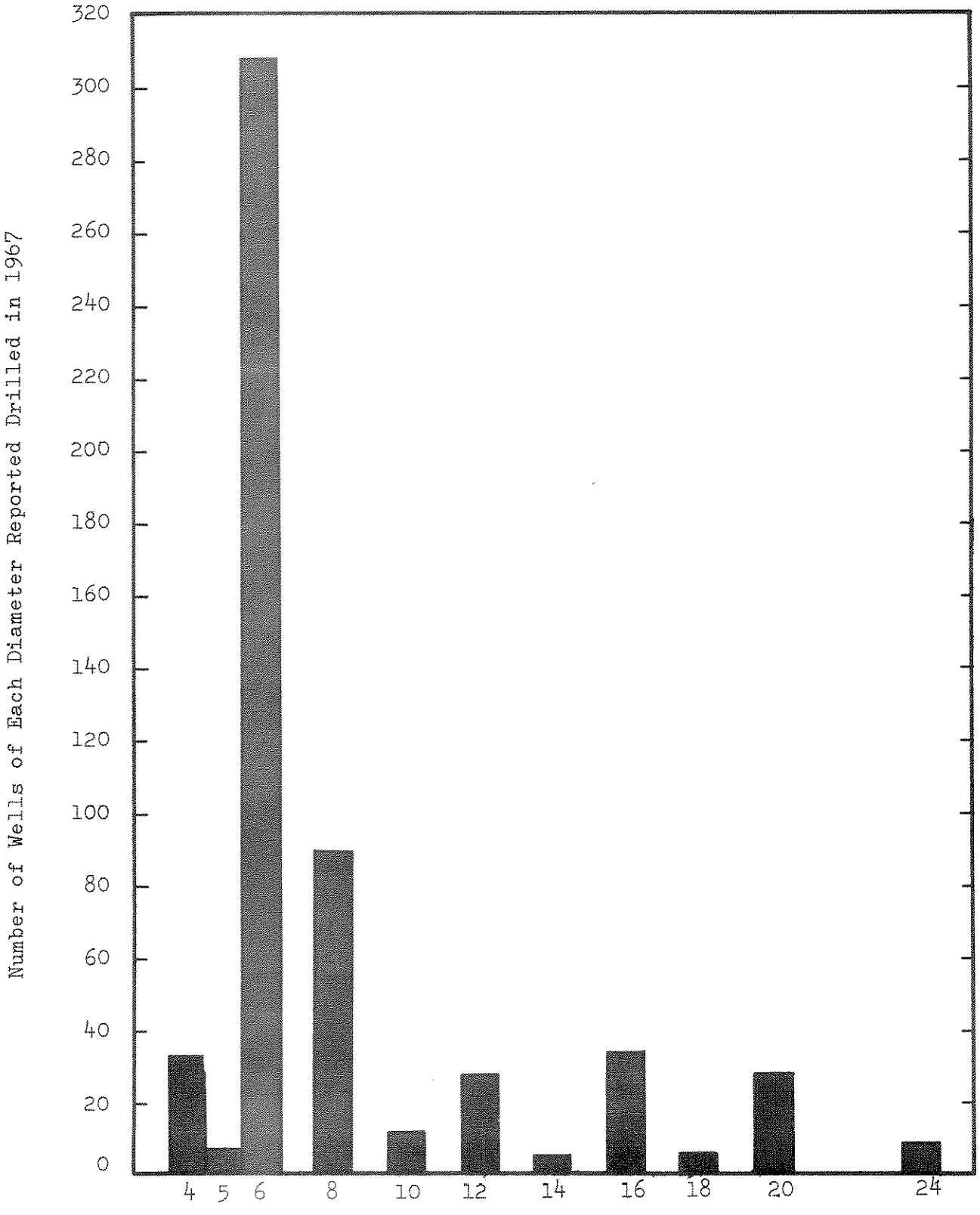


Figure 4

Number and Diameter of Wells Reported Drilled in 1967

either in domestic or irrigation wells. The 4-inch diameter casings are used exclusively in domestic wells, primarily in northern Idaho. The 10 through 24-inch diameter wells indicate the irrigation development in the state. The mean diameter of wells reported drilled in 1967 is 6 inches. The ratio of domestic wells to irrigation wells reported drilled is approximately 2.5 to 1. This ratio does not, however, indicate the relative importance of the two types of wells on the ground-water resource. An irrigation system is designed to operate almost continuously throughout the irrigation season at a high rate of discharge. A domestic system operates year around on a demand schedule at a much lower rate of discharge. The ground-water resource is depleted by a large scale irrigation project much faster than by many domestic wells. Thus, in analyzing the development of the ground-water resource, much greater emphasis must be placed on the irrigation filings and development.

The Boise River (63), Aberdeen-Springfield (35), and Minidoka-Jerome (36) areas were the centers of ground-water interest and development in 1967 (See Table 2). While the Boise River drainage (63) was the most active area both in applications and wells drilled, the southern Snake River plain areas (35 and 36) were more important in the total development of the ground-water resource. These areas have the potential of increasing the total pumpage of the state by 50 to 60 percent. Other areas where extensive ground-water irrigation development occurred in 1967 include the Portneuf River (29), Camas Creek and Mud Lake (31), Wood Rivers (37), Goose Creek-Rock

TABLE 2

Wells Reported Drilled and Applications Filed for Ground Water in 1967 (Percent)

Numbers	Basin Name	Wells Reported Drilled in 1967 (Percent)	Applications Filed for Ground Water in 1967 (Percent)
11 - 17	Great Basin	3	4
21 - 29	Snake River Tributaries above American Falls	13	7
31 - 37	Snake Plain & Tributaries	15	31
41 - 47	Snake River Tributaries - South Side	6	13
51 - 57	Owyhee County	2	8
61 - 69	Southwest Idaho	40	29
71 - 79	Salmon River	5	1
81 - 87	Clearwater River	4	1
91 - 98	Columbia River Tributaries	12	6
	Total State	100	100

Creek (45), Mountain Home (61), and Lake Coeur d'Alene-Rathdrum Prairie (95) areas. The development of ground water for domestic purposes occurred throughout the state, with concentrations in population centers such as the Boise and Payette River basins (63 and 65).

The pattern of ground-water development in Idaho in 1968 is expected to be similar to that of 1967. Changes will be evident as new lands are opened to ground-water irrigation either by the desert land entry method or by the changing of supply from surface water to ground water. The most important developments should occur on or near the Snake River Plain.